

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

- 1        1.        (Currently Amended) A method for controlling magnetostriction in a free layer of a magnetic memory device, comprising:
  - 3              forming a pinned layer;
  - 4              forming a separation layer over the pinned layer;
  - 5              forming a bilayer, composite free layer, the forming the bilayer, composite free
  - 6              layer includes:
    - 7              forming a first free layer having a first thickness of CoFe; and
    - 8              forming a second free layer having a second thickness, the ratio of the first
    - 9              thickness and second thickness being selected to provide a desired magnetostriction of
    - 10              NiFe;
    - 11              wherein the forming the first free layer of CoFe and the forming of the
    - 12              second free layer of NiFe further comprises forming a thickness ratio of the first free
    - 13              layer of CoFe to second layer of NiFe by forming the first free layer of CoFe with a
    - 14              predetermined first thickness and forming the second free layer of NiFe with a
    - 15              predetermined second thickness, wherein the ratio of the predetermined first thickness to
    - 16              the predetermined second thickness is selected to provide a predetermined
    - 17              magnetostriction without changing the composition of the first or second free layer.
- 1        2.        (Canceled)

1           3.       (Original)     The method of claim 1, wherein the separation layer is a  
2     conductor layer.

1           4.       (Original)     The method of claim 1, wherein the separation layer is an  
2     insulation layer.

1        5. (Currently Amended) A magnetic sensor, comprising:  
2            a pinned layer;  
3            a separation layer formed over the pinned layer;  
4            a first free layer having a first thickness formed over the separation layer; and  
5            a second free layer having a second thickness formed over the first free layer,  
6        wherein the ratio of the first thickness and second thickness is selected to provide a  
7        desired magnetostriction  
8        a bilayer, composite free layer, the bilayer, composite free layer includes:  
9            a first free layer having a first thickness of CoFe formed over the  
10      separation layer; and  
11            a second free layer having a second thickness of NiFe formed over the  
12      first free layer, wherein the ratio of the first thickness and second thickness is selected to  
13      provide a desired magnetostriction;  
14            wherein the first free layer of CoFe includes a first predetermined  
15      thickness and the second free layer of NiFe includes a second predetermined thickness,  
16      the first and second predetermined thicknesses are selected to provide a predetermined  
17      thickness ratio of the first free layer of CoFe to second layer of NiFe to provide a  
18      predetermined magnetostriction without changing the composition of the first or second  
19      free layer.

1        6. (Canceled)

- 1            7.        (Original)      The magnetic sensor of claim 5, wherein the separation
- 2        layer is a conductor layer.
  
- 1            8.        (Original)      The magnetic sensor of claim 5, wherein the separation
- 2        layer is an insulation layer.

1           9. (Currently Amended) A magnetic tunnel junction sensor, comprising:  
2           a magnetic tunnel junction device comprising:  
3                 a pinned layer;  
4                 an insulation layer formed over the pinned layer;  
5                 a bilayer, composite free layer, the bilayer, composite free layer  
6           includes:  
7                 a first free layer having a first thickness of CoFe formed  
8           over the separation layer; and  
9                 a second free layer having a second thickness of NiFe  
10          formed over the first free layer, wherein the ratio of the first thickness and second  
11          thickness is selected to provide a desired magnetostriction;  
12          wherein the first free layer of CoFe includes a first  
13          predetermined thickness and the second free layer of NiFe includes a second  
14          predetermined thickness, the first and second predetermined thicknesses are selected to  
15          provide a predetermined thickness ratio of the first free layer of CoFe to second layer of  
16          NiFe to provide a predetermined magnetostriction without changing the composition of  
17          the first or second free layer;  
18          a current source coupled to the magnetic tunnel junction device; and  
19          a magnetoresistance detector, coupled to the magnetic tunnel junction device, for  
20          detecting an electrical resistance through the magnetic tunnel junction device based on  
21          magnetic orientations of the first and the second free layers.

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1 10. (Canceled)

1           11. (Currently Amended) A magnetic storage system, comprising:  
2           a movable magnetic recording medium;  
3           a magnetic sensor for detecting magnetic signals on the moveable recording  
4           medium, comprising:  
5            a pinned layer;  
6            a separation layer formed over the pinned layer;  
7            a first free layer having a first thickness formed over the separation layer;  
8       and  
9            a second free layer having a second thickness formed over the first free  
10          layer, wherein the ratio of the first thickness and second thickness is selected to provide a  
11          desired magnetostriction;  
12          a bilayer, composite free layer, the bilayer, composite free layer includes:  
13            a first free layer of CoFe formed over the separation layer; and  
14            a second free layer of NiFe formed over the first free layer;  
15            wherein the first free layer of CoFe includes a first predetermined  
16          thickness and the second free layer of NiFe includes a second predetermined thickness,  
17          the first and second predetermined thicknesses are selected to provide a predetermined  
18          thickness ratio of the first free layer of CoFe to second layer of NiFe to provide a  
19          predetermined magnetostriction without changing the composition of the first or second  
20          free layer;  
21            a magnetoresistance detector, coupled to the magnetic sensor, for detecting an  
22          electrical resistance through the magnetic sensor based on magnetic orientations of the

23 first and the second free layers; and  
24 an actuator, coupled to the magnetic sensor, for moving the sensor relative to the  
25 medium.

1 12. (Canceled)

1           13. (Currently Amended) A spin valve sensor, comprising  
2           a bilayer free layer structure, the bilayer free layer structure including a first free  
3           layer of CoFe having a first predetermined thickness formed and a second free layer of  
4           NiFe having a second predetermined thickness formed over the first free layer, wherein  
5           the ratio of the first thickness and second thickness is selected to provide a desired  
6           magnetostriiction a thickness ratio of the first free layer of CoFe to second layer of NiFe is  
7           selected to provide a predetermined magnetostriiction without changing the composition  
8           of the first or second free layer;  
9           a ferromagnetic pinned layer structure having a magnetic moment;  
10          a nonmagnetic conductive separation layer disposed between the free layer  
11          structure and the pinned layer structure;  
12          an anti-ferromagnetic pinning layer coupled to the pinned layer structure for  
13          pinning the magnetic moment of the pinned layer structure;  
14          hard magnetic thin films in an abutting relationship with the free layer structure  
15          on both sides of the free layer structure; and  
16          a seedlayer seed layer structure adjacent the pinning layer structure.

1           14. (Canceled)

1           15. (Currently Amended) A spin valve sensor, comprising  
2           a bilayer free layer structure, the bilayer free layer structure including a first free  
3           layer having of CoFe a first predetermined thickness and a second free layer of NiFe  
4           having a second predetermined thickness formed over the first free layer, wherein the  
5           ratio of the first thickness and second thickness is selected to provide a desired  
6           magnetostriiction a thickness ratio of the first free layer of CoFe to second layer of NiFe is  
7           selected to provide a predetermined magnetostriiction without changing the composition  
8           of the first or second free layer;  
9           a self-pinned layer structure having a magnetic moment;  
10          a nonmagnetic conductive separation layer disposed between the free layer  
11          structure and the self-pinned layer structure;  
12          hard magnetic thin films in an abutting relationship with the free layer structure  
13          on both sides of the free layer structure; and  
14          a seedlayer seed layer structure adjacent the a pinning layer structure.

1           16. (Canceled)

1           17. (Currently Amended) A magnetic sensor, comprising:  
2           means for providing a fixed magnetic orientation;  
3           bilayer means, disposed over the means for providing a fixed magnetic  
4           orientation, for sensing a magnetic field, the bilayer means including first and second  
5           means for providing a magnetization that is free to rotate, the first means having a first  
6           predetermined thickness of CoFe for sensing a magnetic field and second means having a  
7           second predetermined thickness of NiFe for sensing a magnetic field;  
8           means for separating the means for providing a pinning field from the bilayer  
9           means;  
10           wherein the ratio of the first thickness and second thickness is selected to provide  
11           a desired magnetostriction wherein a thickness ratio of the first free layer of CoFe to  
12           second layer of NiFe is selected to provide a predetermined magnetostriction without  
13           changing the composition of the first or second free layer.